



MATHS

BOOKS - CENGAGE MATHS (ENGLISH)

THREE DIMENSIONAL GEOMETRY

Others

1. Find the angle between the line whose direction cosines are given by

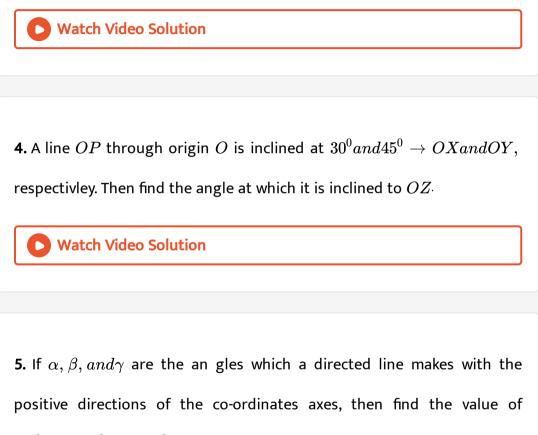
$$l + m + n = 0 and l^2 + m^2 - n^2 - 0.$$

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2. A line makes angles $\alpha, \beta, \gamma and \delta$ with the diagonals of a cube. Show

that
$$\cos^2lpha+\cos^2eta+\cos^2\gamma+\cos^2\delta=4/3.$$

3. *ABC* is a triangle and A=(2,3,5),B=(-1,3,2) and C= $(\lambda, 5, \mu)$. If the median through *A* is equally inclined to the axes, then find the value of λ and μ



 $\sin^2lpha+\sin^2eta+\sin^2\gamma_\cdot$

6. If the sum of the squares of the distance of a point from the three coordinate axes is 36, then find its distance from the origin.



7. If A(3,2, -4), B(5,4, -6) and C(9,8, -10) are three collinear

points, then find the ratio in which point C divides AB.

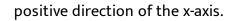
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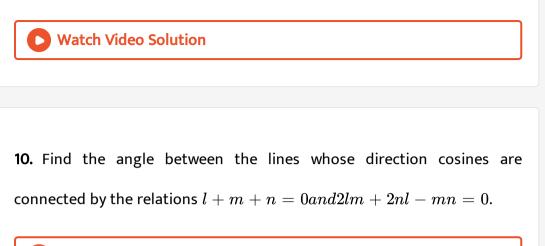
8. Find the ratio in which the y-z plane divides the join of the points

$$(-2,4,7)$$
 and $(3, -5,8)$.

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9. A line passes through the points (6, -7, -1) and (2, -3, 1). Find te direction cosines off the line if the line makes an acute angle with the



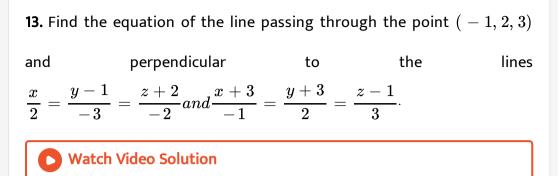


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11. Find the point where line which passes through point (1, 2, 3) and is parallel to line $\overrightarrow{r} = \hat{i} + \hat{j} + 2\hat{k} + \lambda(\hat{i} - 2\hat{j} + 3\hat{k})$ meets the xy-plane.

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12. Find the equation of the line passing through the points (1, 2, 3) and (-1, 0, 4).

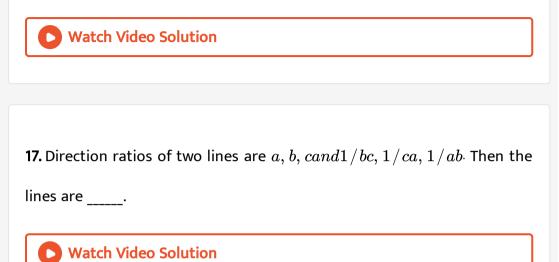


14. The line joining the points (-2, 1, -8) and (a, b, c) is parallel to the line whose direction ratios are 6, 2, and 3. Find the values of a, b and c

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15. A parallelepiped is formed by planes drawn through the points P(6, 8, 10) and (3, 4, 8) parallel to the coordinate planes. Find the length of edges and diagonal of the parallelepiped.

16. Find the angle between any two diagonals of a cube.



18. Find the equation of the line passing through the intersection of $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ and also through the point (2, 1, -2).

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19. The straight line $\frac{x-3}{3} = \frac{y-2}{1} = \frac{z-1}{0}$ is (a)Parallel to x-axis (b)Parallel to the y-axis (c)Parallel to the z-axis (d)Perpendicular to the z-

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20. Find the equation of a plane containing the lines
$$\frac{x-5}{4} = \frac{y-7}{4} = \frac{z+3}{-5}$$
 and $\frac{x-8}{7} = \frac{y-4}{1} = \frac{z-5}{3}$.
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21. Find the equation of the plane passing through the points

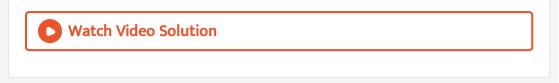
(1, 0, -1)and(3, 2, 2) and parallel to the line $x - 1 = \frac{1 - y}{2} = \frac{z - 2}{3}$.

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22. Find the equation of the sphere described on the joint of points AandB having position vectors $2\hat{i} + 6\hat{j} - 7\hat{k}and - 2\hat{i} + 4\hat{j} - 3\hat{k}$,

axis

respectively, as the diameter. Find the center and the radius of the sphere.



23. Find the radius of the circular section in which the sphere $\left| \overrightarrow{r} \right| = 5$ is

cut by the plane
$$\overrightarrow{r}\cdot\left(\hat{i}+\hat{j}+\hat{k}
ight)=3\sqrt{3.}$$

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24. Find the equation of a sphere which passes through (1, 0, 0)(0, 1, 0)and(0, 0, 1), and has radius as small as possible.

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25. Find the locus of a point which moves such that the sum of the squares of its distance from the points A(1, 2, 3), B(2, -3, 5) and C(0, 7, 4) is 120.

26. Find the equation of the sphere which has centre at the origin and

touches the line 2(x + 1) = 2 - y = z + 3.

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27. Find the equation of the sphere which passes through (1, 0, 0), (0, 1, 0) and (0, 0, 1) and whose centre lies on the plane 3x - y + z = 2.

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28. Find the equation of a sphere whose centre is (3, 1, 2) radius is 5.

29. Find the equation of the sphere passing through (0, 0, 0), (1, 0, 0), (0, 1, 0) and (0, 0, 1).

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30. Find the image of the line $\frac{x-1}{9} = \frac{y-2}{-1} = \frac{z+3}{-3}$ in the plane 3x - 3y + 10z - 26 = 0. Watch Video Solution

31. Find the equations of the bisectors of the angles between the planes 2x - y + 2z + 3 = 0 and 3x - 2y + 6z + 8 = 0 and specify the plane which bisects the acute angle and the plane which bisects the obtuse angle.

32. If the x-coordinate of a point P on the join of Q(2, 2, 1) and R(5, 1, -2) is4, then find its z – coordinate.

33. A sphere of constant radius k passes through the origin and meets the axes at A, B and C. Prove that the centroid of triangle ABC lies on the sphere $9(x^2 + y^2 + z^2) = 4k^2$.

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34. A variable plane passes through a fixed point (a, b, c) and cuts the coordinate axes at points A, B, andC. Show that eh locus of the centre of the sphere $OABCis \frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$.

35. Show that the plane 2x-2y+z+12=0 touches the sphere $x^2+y^2+z^2-2x-4y+2z-3=0.$



36. If O is the origin, OP = 3, with direction ratios -1, 2 and -2, then find the coordinates of P.

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37. If P(x, y, z) is a point on the line segment joining Q(2,2,4) and R(3,5,6) such that the projection of \overrightarrow{OP} on the axes are $\frac{13}{9}, \frac{19}{5}, \frac{26}{5}$ respectively, then P divides QR in the ratio:

38. If \overrightarrow{r} is a vector of magnitude 21 and has direction ratios 2, -3 and 6, then find \overrightarrow{r} .



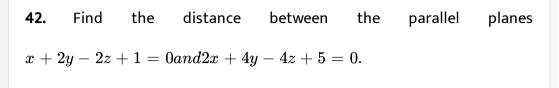
39. Find the distance of the point P(a, b, c) from the x-axis.

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40. A line makes angles $lpha, eta and \gamma$ with the coordinate axes. If $lpha+eta=90^0,$ then find γ .

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41. If a line makes angles α , $\beta and\gamma$ with threew-dimensional coordinate axes, respectively, then find the value of $\cos 2\alpha + \cos 2\beta + \cos 2\gamma$.





43. A ray of light passing through the point A(1,2,3) , strikews the plane xy+z=12atB and on reflection passes through point C(3,5,9). Find the coordinate so point B.

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44. The plane ax + by = 0 is rotated through an angle α about its line of intersection with the plane z = 0. Show that he equation to the plane in the new position is $ax + by \pm z\sqrt{a^2 + b^2} \tan \alpha = 0$

45. Find the equation of a plane containing the line of intersection of the planes x + y + z - 6 = 0 and 2x + 3y + 4z + 5 = 0 passing through (1, 1, 1).



46. Find the locus of a point, the sum of squares of whose distance from

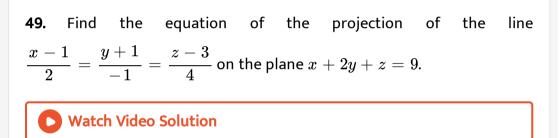
the planes x-z=0, x-2y+z=0 and x+y+z=0 is 36

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47. Find the length and the foot of the perpendicular from the point (7, 14, 5) to the plane 2x + 4y - z = 2. Also, the find image of the point *P* in the plane.

48. Find the angle between the lines $\overrightarrow{r} = \hat{i} + 2\hat{j} - \hat{k} + \lambda(\hat{i} - \hat{j} + \hat{k})$ and the plane $\overrightarrow{r} = 2\hat{i} - \hat{j} + \hat{k} = 4$.

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50. Find the equation the plane which contain the line of intersection of the planes $\vec{r} \cdot \hat{i} + 2\hat{j} + 3\hat{k} - 4 = 0$ and $\vec{r} \cdot 2\hat{i} + \hat{j} - \hat{k} + 5 = 0$ and which is perpendicular to the plane $\vec{r} \left(5\hat{i} + 3\hat{j} - 6\hat{k}\right) + 8 = 0$.

51. Find the vector equation of the line passing through (1, 2, 3) and parallel to the planes $\rightarrow r\hat{i} - \hat{j} + 2\hat{k} = 5$ and $\rightarrow r3\hat{i} + \hat{j} + \hat{k} = 6$.

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52. Find the distance of the point P(3, 8, 2) from the line $\frac{1}{2}(x-1) = \frac{1}{4}(y-3) = \frac{1}{3}(z-2)$ measured parallel to the plane 3x + 2y - 2z + 15 = 0.

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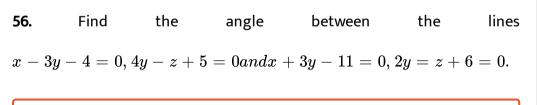
53. Find the distance of the point (1, 0, -3) from the plane x - y - z = 9 measured parallel to the line $\frac{x-2}{2} = \frac{y+2}{2} = \frac{z-6}{-6}$.

54. Show that ax + by + r = 0, by + cz + p = 0 and cz + ax + q = 0are perpendicular to x - y, y - zandz - x planes, respectively.

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55. Reduce the equation of line x - y + 2z = 5adn3x + y + z = 6 in symmetrical form. Or Find the line of intersection of planes x - y + 2z = 5and3x + y + z = 6.

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57. If the line x = y = z intersect the line $\sin A\dot{x} + \sin B\dot{y} + \sin C\dot{z} = 2d^2$, $\sin 2A\dot{x} + \sin 2B\dot{y} + \sin 2C\dot{z} = d^2$, then find the value of $\frac{\sin A}{2} \frac{\sin B}{2} \frac{\sin C}{2}$ where A, B, C are the angles of a triangle.

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58. The point of intersecting of the line passing through (0, 0, 1) and

intersecting the lines x + 2y + z = 1, -x + y - 2z = 2 and x + y = 2, x + z = 2 with xy-plane is

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59. A horizontal plane 4x - 3y + 7z = 0 is given. Find a line of greatest slope passes through the point (2, 1, 1) in the plane 2x + y - 5z = 0.

60. Find the equation of the plane passing through the points (-1, 1, 1) and (1, -1, 1) and perpendicular to the plane x + 2y + 2z = 5.

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61. Find ten equation of the plane passing through the point (0, 7, -7)

and containing the line
$$rac{x+1}{-3}=rac{y-3}{2}=rac{z+2}{1}$$
 .

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62. If a plane meets the equations axes at A, BandC such that the centroid of the triangle is (1, 2, 4), then find the equation of the plane.

63. Find the equation of the plane which is parallel to the lines $\overrightarrow{r} = \hat{i} + \hat{j} + \lambda \left(2\hat{i} + \hat{j} + 4\hat{k}\right) and \frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ and is

passing through the point (0, 1, -1).

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64. Show that the plane whose vector equation is $\overrightarrow{r}\hat{i} + 2\hat{j} = \hat{k} = 3$ contains the line whose vector equation is $\overrightarrow{r}\hat{i} + \hat{j} + \lambda\left(2\hat{i} + \hat{j} + 4\hat{k}\right)$.

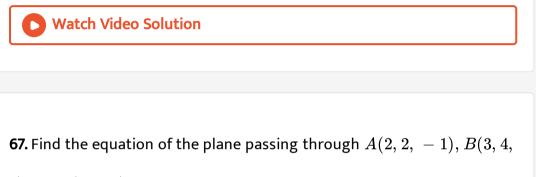
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65. Find the vector equation of the following planes in Cartesian form:

$$\overrightarrow{r} = \hat{i} - \hat{j} + \lambda ig(\hat{i} + \hat{j} + \hat{k} ig) + \mu ig(\hat{i} - 2\hat{j} + 3\hat{k} ig) \cdot$$

line of intersection of the planes 66. Show that the $\overrightarrow{r}\hat{i}+2\hat{j}+3\hat{k}=0$ and $\overrightarrow{r}=\left(3\hat{i}+2\hat{j}+\hat{k}
ight)=0$ is equally inclined to

iandk· Also find the angle it makes with j·



2) and C(7, 0, 6).

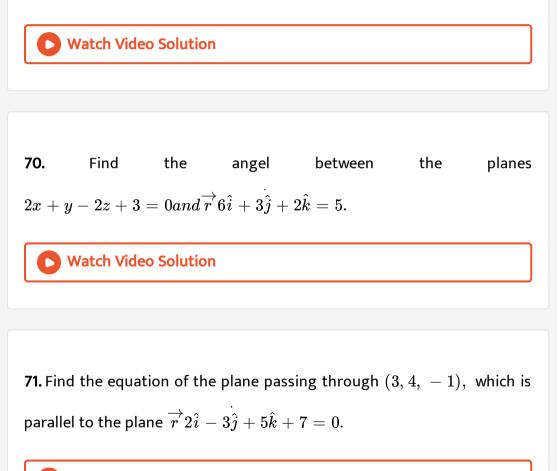
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68. Find the equation of the plane such that image of point (1, 2, 3) in it

is(-1, 0, 1)



69. The foot of the perpendicular drawn from the origin to a plane is (1, 2, -3). Find the equation of the plane. or If O is the origin and the coordinates of P is (1, 2, -3), then find the equation of the plane passing through P and perpendicular to OP.



72. Find the distance of the point (-1, -5, -10) from the point of intersection of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and plane x - y + z = 5.

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73. Find the equation of the plane passing through the point (-1, 3, 2)

and perpendicular to each of the planes

$$x + 2y + 3z = 5and3x + 3y + z = 0.$$

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74. Find the angle between the line $\frac{x-1}{3} = \frac{y-1}{2} = \frac{z-1}{4}$ and the

plane
$$2x + y - 3z + 4 = 0$$
.

75. Find the distance between the line $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z-2}{1}$ and the plane x + y + z + 3 = 0. Watch Video Solution

76. The extremities of a diameter of a sphere lie on the positive y- and positive z-axes at distance 2 and 4, respectively. Show that the sphere passes through the origin and find the radius of the sphere.

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77. A plane passes through a fixed point (a, b, c). Show that the locus of the foot of the perpendicular to it from the origin is the sphere $x^2 + y^2 + z^2 - ax - by - cz = 0.$

78. Find the radius of the circular section of the sphere $\left| \overrightarrow{r} \right| = 5$ by the plane $\overrightarrow{r}\hat{i} + 2\dot{\hat{j}} - \hat{k} = 4\sqrt{3}$.

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79. A point P(x, y, z) is such that 3PA = 2PB, where AandB are the point (1, 3, 4)and(1, -2, -1), irrespectivley. Find the equation to the locus of the point P and verify that the locus is a sphere.

80. Find the shortest distance between lines

$$\vec{r} = (\hat{i} + 2\hat{j} + \hat{k}) + \lambda(\hat{i} - \hat{j} + \hat{k}) and \vec{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu(2\hat{i} + \hat{j} + 2\hat{k})$$

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81. Find the shortest distance between the lines

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} and \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}.$$
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82. Determine whether the following pair of lines intersect or not. (1) $\vec{r} = \hat{i} - 5\hat{j} + \lambda \left(2\hat{i} + \hat{k}\right); \vec{r} = 2\hat{i} - \hat{j} + \mu \left(\hat{i} + \hat{j} - \hat{k}\right)$ (2) $\vec{r} = \hat{i} + \hat{j} - \hat{k} + \lambda \left(3\hat{i} - \hat{j}\right); \vec{r} = 4\hat{i} - \hat{k} + \mu \left(2\hat{i} + 3\hat{k}\right)$

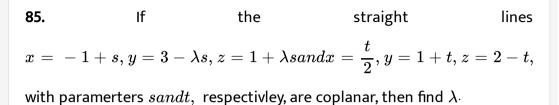
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83. Find the equation of plane which is at a distance $\frac{4}{\sqrt{14}}$ from the origin

and is normal to vector $2\hat{i}+\hat{j}-3\hat{k}$

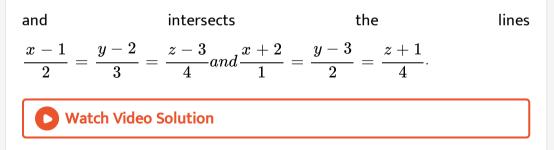
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84. Find the unit vector perpendicular to the plane $\overrightarrow{r}2\hat{i}+\hat{j}+2\hat{k}=5.$



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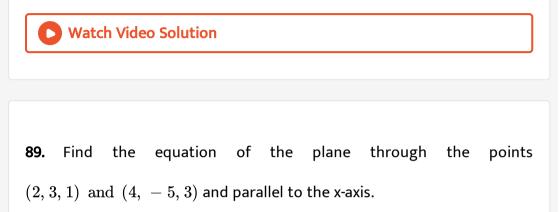
86. Find the equation of a line which passes through the point (1, 1, 1)



87. Find the vector equation of a line passing through $3\hat{i} - 5\hat{j} + 7\hat{k}$ and perpendicular to the plane 3x - 4y + 5z = 8.

88. Find the equation of the plane passing through the point $\left(2,3,1
ight)$

having (5, 3, 2) as the direction ratio is of the normal to the plane.



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90. Find the equation of the image of the plane x - 2y + 2z - 3 = 0 in

plane x + y + z - 1 = 0.

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91. Find the equation of a plane which passes through the point (1, 2, 3)

x - 2y + 2z - 3 = 0 and 8x - 4y + z - 7 = 0.



92. Find the equation of a plane which is parallel to the plane x - 2y + 2z = 5 and whose distance from the point (1, 2, 3) is 1.

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93. Find the direction ratios of orthogonal projection of line $\frac{x-1}{1} = \frac{y+1}{-2} = \frac{z-2}{3}$ in the plane x - y + 2z - 3 = 0. Also find the direction ratios of the image of the line in the plane.

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94. Find the equation of the plane which passes through the point (1, 2, 3) and which is at the minimum distance from the point (-1, 0, 2).

95. Find the angle between the lines $\overrightarrow{r} = \hat{i} + 2\hat{j} - \hat{k} + \lambda \left(\hat{i} - \hat{j} + \hat{k}\right)$

and the plane $\overrightarrow{r}=2\hat{i}-\dot{\hat{j}}+\hat{k}=4.$

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96. Find the equation of the plane passing through the line $\frac{x-1}{5} = \frac{y+2}{6} = \frac{z-3}{4}$ and point (4, 3, 7). **Vatch Video Solution**

97. Find the equation of the plane perpendicular to the line $\frac{x-1}{2} = \frac{y-3}{-1} = \frac{z-4}{2}$ and passing through the origin.

98. Find the equation of the plane passing through the straight line $\frac{x-1}{2} = \frac{y+2}{-3} = \frac{z}{5}$ and perpendicular to the plane x - y + z + 2 = 0.

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99. Find the equation of the line drawn through the point (1, 0, 2) to meet at right angles to the line $\frac{x+1}{3} = \frac{y-2}{-2} = \frac{z+1}{-1}$.

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100. If
$$\overrightarrow{r} = \left(\hat{i}+2\hat{j}+3\hat{k}
ight) + \lambda \left(\hat{i}-\hat{j}+\hat{k}
ight)$$
 and

 $\overrightarrow{r}=\left(\hat{i}+2\hat{j}+3\hat{k}
ight)+\mu\!\left(\hat{i}+\hat{j}-\hat{k}
ight)$ are two lines, then the equation

of acute angle bisector of two lines is

101. Find the coordinates of a point on the $rac{x-1}{2}=rac{y+1}{-3}=z$ atg a distance $4\sqrt{14}$ from the point $(1,\ -1,0)$.

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102. Line L_1 is parallel to vector $\overrightarrow{\alpha} = -3\hat{i} + 2\hat{j} + 4\hat{k}$ and passes through a point A(7, 6, 2) and line L_2 is parallel vector $\overrightarrow{\beta} = 2\hat{i} + \hat{j} + 3\hat{k}$ and point B(5, 3, 4). Now a line L_3 parallel to a vector $\overrightarrow{r} = 2\hat{i} - 2\hat{j} - \hat{k}$ intersects the lines L_1 and L_2 at points C and D, respectively, then find $|\overrightarrow{C}D|$.

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103. Find the values
$$p$$
 so that line
 $\frac{1-x}{3} = \frac{7y-14}{2p} = \frac{z-3}{2}$ and $\frac{7-7x}{3p} = \frac{y-5}{1} = \frac{6-z}{5}$ are at

right angles.

104. Find the angel between the following pair of lines:

$$\vec{r} = 2\hat{i} - 5\hat{j} + \hat{k} + \lambda \left(3\hat{i} + 2\hat{j} + 6\hat{k}\right) and \vec{r} = 7\hat{i} - 6\hat{k} + \mu \left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$$

$$\frac{x}{2} = \frac{y}{2} = \frac{z}{1}and\frac{x-5}{4} = \frac{y-2}{1} = \frac{z-3}{8}$$

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105. Fid the condition if lines
$$x = ay + b, z = cy + dandx = a'y + b', z = c'y + d'$$
 are perpendicular.

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106. Find the acute angle between the lines
$$\frac{x-1}{l} = \frac{y+1}{m} = \frac{1}{n}$$
 and $= \frac{x+1}{m} = \frac{y-3}{n} = \frac{z-1}{l}$ where $l > m > n$, are the roots of the cubic equation $x^3 + x^2 - 4x = 4$.

107. Find the length of the perpendicular drawn from point (2, 3, 4) to

line
$$\frac{4-x}{2} = \frac{y}{6} = \frac{1-z}{3}$$

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108. Find the coordinates of the foot of the perpendicular drawn from point A(1, 0, 3) to the join of points B(4, 7, 1)andC(3, 5, 3).

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109. Find the vector equation of the line passing through (1, 2, 3) and parallel to the planes $\vec{r} \cdot \hat{i} - \hat{j} + 2\hat{k}and\vec{r} \cdot 3\hat{i} + \hat{j} + \hat{k} = 6.$

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110. Find the value of m for which the straight line 3x - 2y + z + 3 = 0 = 4x + 3y + 4z + 1 is parallel to the plane 2x - y + mz - 2 = 0.

111. Show that the lines $\frac{x-a+d}{\alpha-\delta} = \frac{y-a}{\alpha} = \frac{z-a-d}{\alpha+\delta}$ and $\frac{x-b+c}{\beta-\gamma} = \frac{y-b}{\beta} = \frac{z-b-c}{\beta+\gamma}$ are coplanar.

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112. Find the equation of line x + y - z - 3 = 0 = 2x + 3y + z + 4 in

symmetric form. Find the direction ratio of the line.

113. Find the vector equation of line passing through the point (1, 2, -4) and perpendicular to the two lines: $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$

114. Find the vector equation of line passing through A(3, 4-7)andB(1, -1, 6). Also find its Cartesian equations.

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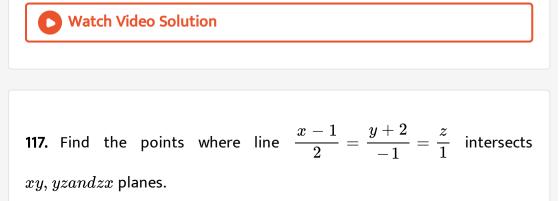
115. Find Cartesian and vector equation of the line which passes through

the point (-2, 4, -5) and parallel to the line given by $\frac{x+3}{3} = \frac{y-4}{5} = \frac{z+8}{6}$.

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116. Find the equation of a line which passes through the point (2, 3, 4)

and which has equal intercepts on the axes.



118. A mirror and source of light are situated at the origin O and a point on OX respectively. A ray of light from the source strikes the mirror and is reflected. If the DRs of the normal to the plane of mirror are 1, -1, 1, then DCs for the reflacted ray are :

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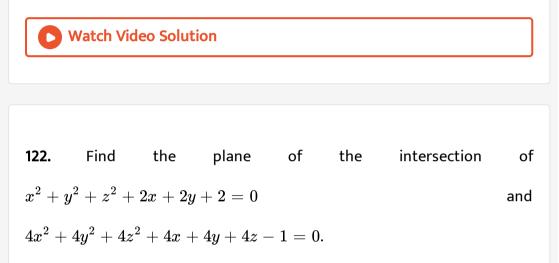
119. The Cartesian equation of a line is $rac{x-3}{2}=rac{y+1}{-2}=rac{z-3}{5}$. Find

the vector equation of the line.

120. The Cartesian equations of a line are 6x - 2 = 3y + 1 = 2z - 2.

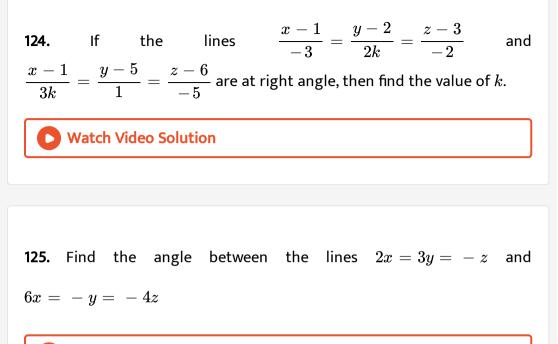
Find its direction ratios and also find a vector equation of the line.

121. A line passes through the point with position vector $2\hat{i} - 3\hat{j} + 4\hat{k}$ and is in the direction of $3\hat{i} + 4\hat{j} - 5\hat{k}$. Find the equations of the line in vector and Cartesian forms.



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123. Let l_1andl_2 be the two skew lines. If P, Q are two distinct points on l_1ndR, S are two distinct points on l_2 , then prove that PR cannot be parallel to QS.



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126. Find the length of the perpendicular drawn from the point (5, 4, -1) to the line $\overrightarrow{r} = \hat{i} + \lambda \left(2\hat{i} + 9\hat{j} + 5\hat{k}\right)$, wher λ is a parameter.

127. The equations of motion of a rocket are x = 2t, y = -4tandz = 4t, where time t is given in seconds, and the coordinates of a moving points in kilometers. What is the path of the rocket? At what distance will be the rocket from the starting point O(0, 0, 0) in 10s?



128. Find the shortest distance between the lines

$$\overrightarrow{r} = (1-\lambda)\hat{i} + (\lambda-2)\hat{j} + (3-2\lambda)\hat{k}$$
 and
 $\overrightarrow{r} = (\mu+1)\hat{i} + (2\mu+1)\hat{k}$.

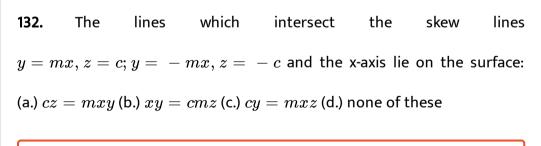
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129. Find the image of the point (1, 2, 3) in the line $\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$.

130. If the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$ intersect, then find the value of k. Watch Video Solution

131. Find the shortest distance between the z-axis and the line, x + y + 2z - 3 = 0, 2x + 3y + 4z - 4 = 0.

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133. Distance of the point $P\left(\overrightarrow{p}\right)$ from the line $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b}$ is a.

$$\begin{vmatrix} (\overrightarrow{a} - \overrightarrow{p}) + \frac{\left((\overrightarrow{p} - \overrightarrow{a}) \stackrel{\cdot}{\overrightarrow{b}} \right) \stackrel{\cdot}{\overrightarrow{b}}}{\left| \overrightarrow{b} \right|^{2}} \\ \begin{pmatrix} (\overrightarrow{p} - \overrightarrow{a}) \stackrel{\cdot}{\overrightarrow{b}} \right) \stackrel{\cdot}{\overrightarrow{b}} \\ \begin{pmatrix} (\overrightarrow{p} - \overrightarrow{a}) \stackrel{\cdot}{\overrightarrow{b}} \right) \stackrel{\cdot}{\overrightarrow{b}} \\ \left| \overrightarrow{b} \right|^{2} \\ \end{pmatrix} \\ (\overrightarrow{a} - \overrightarrow{p}) + \frac{\left(((\overrightarrow{p} - \overrightarrow{b}) \stackrel{\cdot}{\overrightarrow{b}} \right) \stackrel{\cdot}{\overrightarrow{b}} \\ \left| \overrightarrow{b} \right|^{2} \\ \end{vmatrix} \\ d. \text{ none of these} \\ \end{vmatrix} \\ \\ \textbf{Watch Video Solution}$$

134. The direction ratios of a normal to the plane through (1, 0, 0)and(0, 1, 0), which makes and angle of $\frac{\pi}{4}$ with the plane x + y = 3, are a. $\langle 1, \sqrt{2}, 1 \rangle$ b. $\langle 1, 1, \sqrt{2} \rangle$ c. $\langle 1, 1, 2 \rangle$ d. $\langle \sqrt{2}, 1, 1 \rangle$

135. The centre of the circle given by $\overrightarrow{r}\hat{i} + 2\dot{\hat{j}} + 2\hat{k} = 15and \left|\overrightarrow{r} - (\hat{j} + 2\hat{k})\right| = 4$ is a. (0, 1, 2) b. (1, 3, 4) c. (-1, 3, 4) d. none of these

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136. Two systems of rectangular axes have the same origin. If a plane cuts them at distance a, b, c and a', b', c' from the origin, then a. $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} + \frac{1}{a'^2} + \frac{1}{b'^2} + \frac{1}{c'^2} = 0$ b. $\frac{1}{a^2} - \frac{1}{b^2} - \frac{1}{c^2} + \frac{1}{a'^2} - \frac{1}{b'^2} - \frac{1}{c'^2} = 0$ c. $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} - \frac{1}{a'^2} - \frac{1}{b'^2} - \frac{1}{c'^2} = 0$ d. $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} + \frac{1}{a'^2} + \frac{1}{b'^2} + \frac{1}{c'^2} = 0$

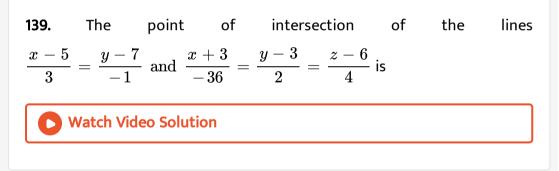
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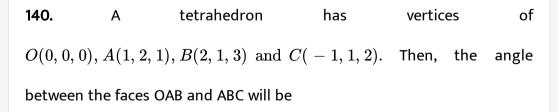
137. Find the equation of a plane which passes through the point (3, 2, 0)

and contains the line
$$rac{x-3}{1}=rac{y-6}{5}=rac{z-4}{4}$$

138. The lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-k}$ and $\frac{x-1}{k} = \frac{y-4}{2} = \frac{z-5}{1}$ are coplanar if a. k = 1 or -1 b. k = 0 or -3 c. k = 3 or -3 d. k = 0 or -1

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141. The radius of the circle in which the sphere $x^2=y^2+z^2+2z-2y-4z-19=0$ is cut by the planex+2y+2z+7=0 is

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142. A sphere of constant radius 2k passes through the origin and meets the axes in A, B, andC. The locus of a centroid of the tetrahedron OABC is a. $x^2 + y^2 + z^2 = 4k^2$ b. $x^2 + y^2 + z^2 = k^2$ c. $2(x^2 + y^2 + z)^2 = k^2$ d. none of these

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143. A plane passes through a fixed point (a,b,c). The locus of the foot of

the perpendicular to it from the origin is a sphere of radius



144. Equation of the plane containing the straight line $\frac{x}{2} = \frac{y}{3} = \frac{z}{4}$ and perpendicular to the plane containing the straight lines $\frac{x}{3} = \frac{y}{4} = \frac{z}{2}$ and $\frac{x}{4} = \frac{y}{2} = \frac{z}{3}$ is

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145. The equation of the plane through the intersection of the planes x + 2y + 3z - 4 = 0 and 4x + 3y + 2z + 1 = 0 and passing through the origin is (a) 17x + 14y + 11z = 0 (b) 7x + 4y + z = 0 (c) x + 14 + 11z = 0 (d) 17x + y + z = 0

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146. The plane 4x + 7y + 4z + 81 = 0 is rotated through a right angle about its line of intersection with the plane 5x + 3y + 10z = 25. The equation of the plane in its new position is a. x - 4y + 6z = 106 b. x - 8y + 13z = 103 c. x - 4y + 6z = 110 d. x - 8y + 13z = 105



147. The vector equation of the plane passing through the origin and the

line of intersection of the planes $\overrightarrow{r} \overrightarrow{a} = \lambda and \overrightarrow{r} \overrightarrow{b} = \mu$ is (a) $\overrightarrow{r} \lambda \overrightarrow{a} - \mu \overrightarrow{b} = 0$ (b) $\overrightarrow{r} \lambda \overrightarrow{b} - \mu \overrightarrow{a} = 0$ (c) $\overrightarrow{r} \lambda \overrightarrow{a} + \mu \overrightarrow{b} = 0$ (d) $\overrightarrow{r} \lambda \overrightarrow{b} + \mu \overrightarrow{a} = 0$

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148. The lines
$$\overrightarrow{r} = \overrightarrow{a} + \lambda \left(\overrightarrow{b} \times \overrightarrow{c}\right) and \overrightarrow{r} = \overrightarrow{b} + \mu \left(\overrightarrow{c} \times \overrightarrow{a}\right)$$
 will intersect if a. $\overrightarrow{a} \times \overrightarrow{c} = \overrightarrow{b} \times \overrightarrow{c}$ b. $\overrightarrow{a} \overrightarrow{c} = \overrightarrow{b} \overrightarrow{c}$ c. $b \times \overrightarrow{a} = \overrightarrow{c} \times \overrightarrow{a}$ d. none of these

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149. The projection of the line $\frac{x+1}{-1} = \frac{y}{2} = \frac{z-1}{3}$ on the plane x - 2y + z = 6 is the line of intersection of this plane with the plane

150. The direction cosines of a line satisfy the relations $\lambda(l+m) = n$ and mn + nl + lm = 0. The value of λ for which the two lines are perpendicular to each other, is

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151. The intercepts made on the axes by the plane which bisects the line

joining the point (1, 2, 3) and (-3, 4, 5) at right angles are :

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152. The pair of lines whose direction cosines are given by the equations

$$3l+m+5n=0and6mn-2nl+5lm=0$$
 are a. parallel b. perpendicular c. inclined at $\cos^{-1}igg(rac{1}{6}igg)$ d. none of these

153. If the distance of the point P(1, -2, 1) from the plane $x + 2y - 2z = \alpha$, where $\alpha > 0$, is 5, then the foot of the perpendicular from P to the plane is a. $\left(\frac{8}{3}, \frac{4}{3}, -\frac{7}{3}\right)$ b. $\left(\frac{4}{3}, -\frac{4}{3}, \frac{1}{3}\right)$ c. $\left(\frac{1}{3}, \frac{2}{3}, \frac{10}{3}\right)$ d. $\left(\frac{2}{3}, -\frac{1}{3}, -\frac{5}{3}\right)$

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154. A line with positive direction cosines passes through the point P(2, -1, 2) and makes equal angles with the coordinate axes. The line meets the plane 2x + y + z = 9 at point Q. The length of the line segment PQ equals

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155. The value of k such that $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$ lies in the plane 2x - 4y + z = 7 is a. 7 b. -7 c. no real value d. 4

156. The equation of the plane passing through lines $\frac{x-4}{1} = \frac{y-3}{1} = \frac{z-2}{2} and \frac{x-3}{2} = \frac{y-2}{-4} = \frac{z}{5}$ is a. 11x - y - 3z = 35 b. 11x + y - 3z = 35 c. 11x - y + 3z = 35 d. none of these

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157. The line through
$$\hat{i} + 3\hat{j} + 2\hat{k}$$
 and \perp to the line
 $\overrightarrow{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \lambda(2\hat{i} + \hat{j} + \hat{k})$ and $\overrightarrow{r} = (2\hat{i} + 6\hat{j} + \hat{k}) + \mu(\hat{i} + 2\hat{j})$
is a. $\overrightarrow{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \lambda(-\hat{i} + 5\hat{j} - 3\hat{k})$ b.
 $\overrightarrow{r} = \hat{i} + 3\hat{j} + 2\hat{k} + \lambda(\hat{i} - 5\hat{j} + 3\hat{k})$ c.
 $\overrightarrow{r} = \hat{i} + 3\hat{j} + 2\hat{k} + \lambda(\hat{i} + 5\hat{j} + 3\hat{k})$ d.
 $\overrightarrow{r} = \hat{i} + 3\hat{j} + 2\hat{k} + \lambda(-\hat{i} - 5\hat{j} - 3\hat{k})$

158. The equation of the plane through the line of intersection of the planes ax + by + cz + d = 0 and a'x + b'y + c'z + d' = 0 parallel to the line y = 0 and z = 0 is

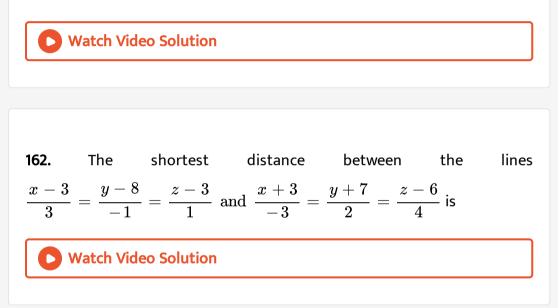
Vatch Video Solution 159. The three planes 4y + 6z = 5, 2x + 3y + 5z = 5 and 6x + 5y + 9z = 10 (a) meet in a point (b) have a line in common (c) form a triangular prism (d) none of these

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160. Given $\overrightarrow{\alpha} = 3\hat{i} + \hat{j} + 2\hat{k}$ and $\overrightarrow{\beta} = \hat{i} - 2\hat{j} - 4\hat{k}$ are the position vectors of the points A and B Then the distance of the point $\hat{i} + \hat{j} + \hat{k}$ from the plane passing through B and perpendicular to AB is (a) 5 (b) 10 (c)15 (d) 20

161. Find the following are equations for the plane passing through the

points P(1, 1, -1), Q(3, 0, 2) and R(-2, 1, 0)?



163. $L_1 and L_2$ and two lines whose vector equations are $L_1: \overrightarrow{r} = \lambda \left(\left(\cos \theta + \sqrt{3} \right) \hat{i} + \left(\sqrt{2} \sin \theta \right) \hat{j} + \left(\cos \theta - \sqrt{3} \right) \hat{k} \right)$ $L_2: \overrightarrow{r} = \mu \left(a \hat{i} + b \hat{j} + c \hat{k} \right)$, where $\lambda and \mu$ are scalars and α is the acute angel between $L_1 and L_2$. If the angel α is independent of θ , then the value of α is a. $\frac{\pi}{6}$ b. $\frac{\pi}{4}$ c. $\frac{\pi}{3}$ d. $\frac{\pi}{2}$

164. Value of λ such that the line $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-1}{\lambda}$ is \perp to normal to the plane \overrightarrow{r} . $\left(2\overrightarrow{i} + 3\overrightarrow{j} + 4\overrightarrow{k}\right) = 0$ is a. $-\frac{13}{4}$ b. $-\frac{17}{4}$ c. 4

d. none of these

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165. Equation of the plane passing through the points (2, 2, 1)and(9, 3, 6), $and \perp$ to the plane 2x + 6y + 6z = 9 is a. 3x + 4y + 5z = 9 b. 3x + 4y - 5z = 9 c. 3x + 4y - 5z = 9 d. none of these

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166. The equation of a plane which passes through the point of intersection of lines $\frac{x-1}{3} = \frac{y-2}{1} = \frac{z-3}{2}$, and $\frac{x-3}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ and at greatest distance from point (0,0,0) is

167. If the foot of the perpendicular from the origin to plane is P(a,b,c) ,

the equation of the plane is a. $rac{x}{a}=rac{y}{b}=rac{z}{c}=3$ b. ax+by+cz=3 c. $ax+by+cz=a^2+b^2+c^2$ d. ax+by+cz=a+b+c

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168. Equation of a line in the plane $\pi = 2x - y + z - 4 = 0$ which is perpendicular to the line *l* whose equation is $\frac{x-2}{1} = \frac{y-2}{-1} = \frac{z-3}{-2}$ and which passes through the point of intersection of *l* and π is (A) $\frac{x-2}{1} = \frac{y-1}{5} = \frac{z-1}{-1}$ (B) $\frac{x-1}{3} = \frac{y-3}{5} = \frac{z-5}{-1}$ (C) $\frac{x+2}{2} = \frac{y+1}{-1} = \frac{z+1}{1}$ (D) $\frac{x-2}{2} = \frac{y-1}{-1} = \frac{z-1}{1}$

169. The intercept made by the plane \overrightarrow{r} . $\overrightarrow{n} = q$ on the x-axis is a. $\frac{q}{\hat{i} \cdot \vec{n}}$ b.

$$rac{\hat{i}\overrightarrow{n}}{q}$$
 c. $rac{\hat{i}\overrightarrow{n}}{q}$ d. $rac{q}{\left|\overrightarrow{n}
ight|}$

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170. The coordinates o the foot of the perpendicular drawn from the origin to the line joining the point (-9, 4, 5) and (10, 0, -1) will be a. (-3, 2, 1) b. (1, 2, 2) c. 4, 5, 3 d. none of these

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171. The point on the line $\frac{x-2}{1} = \frac{y+3}{-2} = \frac{z+5}{-2}$ at a distance of 6 from the point (2, -3, -5) is a. (3, -5, -3) b. (4, -7, -9) c. (0, 2, -1) d. none of these

172. Let A(1, 1, 1), B(2, 3, 5) and C(-1, 0, 2) be three points, then equation of a plane parallel to the plane ABC which is at distance 2 is a. $2x - 3y + z + 2\sqrt{14} = 0$ b. $2x - 3y + z - \sqrt{14} = 0$ c. 2x - 3y + z + 2 = 0 d. 2x - 3y + z - 2 = 0

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173. Let $A(\overrightarrow{a})andB(\overrightarrow{b})$ be points on two skew lines $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{p} and \overrightarrow{r} = \overrightarrow{b} + u \overrightarrow{q}$ and the shortest distance between the skew lines is 1, $where \overrightarrow{p} and \overrightarrow{q}$ are unit vectors forming adjacent sides of a parallelogram enclosing an area of 1/2 units. If angle between AB and the line of shortest distance is 60° , then $AB = a. \frac{1}{2}$ b. 2 c. 1 d. $\lambda R = \{10\}$

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174. Consider three planes $P_1: x-y+z=1$, $P_2: x+y-z=-1$ and $P_3: x-3y+3z=2$ Let L_1, L_2 and L_3 be the lines of intersection of the

planes P_2 and P_3 , P_3 and P_1 and P_1 and P_2 respectively. Statement 1: At least two of the lines L_1 , L_2 and L_3 are non-parallel. Statement 2: The three planes do not have a common point

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175. Consider the planes 3x - 6y - 2z - 15 = 0 and 2x + y - 2z - 5 = 0 Statement 1:The parametric equations of the line intersection of the given planes are x = 3 + 14t, y = 2t, z = 15t. Statement 2: The vector $14\hat{i} + 2\hat{j} + 15\hat{k}$ is parallel to the line of intersection of the given planes.

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176. The length of projection of the line segment joining the points (1, 0, -1) and (-1, 2, 2) on the plane x + 3y - 5z = 6 is equal to a. 2 b. $\sqrt{\frac{271}{53}}$ c. $\sqrt{\frac{472}{31}}$ d. $\sqrt{\frac{474}{35}}$

- 177. If $P_1: \overrightarrow{r} \cdot \overrightarrow{n}_1 d_1 = 0$ $P_2: \overrightarrow{r} \cdot \overrightarrow{n}_2 d_2 = 0$ and $P_3: \overrightarrow{r} \cdot \overrightarrow{n}_3 d_3 = 0$ are three planes and $\overrightarrow{n}_1, \overrightarrow{n}_2$ and \overrightarrow{n}_3 are three non-coplanar vectors, then three lines $P_1 = 0$, $P_2 = 0$; $P_2 = 0$, $P_3 = 0$; $P_3 = 0$ $P_1 = 0$ are
- a. parallel lines
- b. coplanar lines
- c. coincident lines
- d. concurrent lines

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178. Perpendiculars are drawn from points on the line $\frac{x+2}{2} = \frac{y+1}{-1} = \frac{z}{3}$ to the plane x + y + z = 3 The feet of perpendiculars lie on the line (a) $\frac{x}{5} = \frac{y-1}{8} = \frac{z-2}{-13}$ (b) $\frac{x}{2} = \frac{y-1}{3} = \frac{z-2}{-5}$ (c) $\frac{x}{4} = \frac{y-1}{3} = \frac{z-2}{-7}$ (d) $\frac{x}{2} = \frac{y-1}{-7} = \frac{z-2}{5}$

179. The point P is the intersection of the straight line joining the points Q(2, 3, 5) and R(1, -1, 4) with the plane 5x - 4y - z = 1. If S is the foot of the perpendicular drawn from the point T(2, 1, 4) to QR, then the length of the line segment PS is (A) $\frac{1}{\sqrt{2}}$ (B) $\sqrt{2}$ (C) 2 (D) $2\sqrt{2}$

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180. A line l passing through the origin is perpendicular to the lines $l_1: (3+t)\hat{i} + (-1+2t)\hat{j} + (4+2t)\hat{k}, \infty < t < \infty, l_2: (3+s)\hat{i} + (3+2)\hat{k}$ then the coordinates of the point on l_2 at a distance of $\sqrt{17}$ from the point of intersection of $l\&l_1$ is/are:

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181. Two lines $L_1: x = 5$, $\frac{y}{3-\alpha} = \frac{z}{-2}$ and $L_2: x = \alpha$, $\frac{y}{-1} = \frac{z}{2-\alpha}$ are coplanar. Then α can take value (s) a. 1 b. 2 c. 3 d. 4

182. The projection of point $P\left(\overrightarrow{p}
ight)$ on the plane $\overrightarrow{r} \stackrel{\cdot}{\overrightarrow{n}} = q$ is $\left(\overrightarrow{s}
ight)$, then

$$\mathbf{a.} \qquad \overrightarrow{s} = \frac{\left(q - \overrightarrow{p} \cdot \overrightarrow{n}\right) \overrightarrow{n}}{\left|\overrightarrow{n}\right|^{2}} \qquad \mathbf{b.} \qquad \overrightarrow{s} = p + \frac{\left(q - \overrightarrow{p} \cdot \overrightarrow{n}\right) \overrightarrow{n}}{\left|\overrightarrow{n}\right|^{2}} \qquad \mathbf{c.}$$
$$\overrightarrow{s} = p - \frac{\left(\overrightarrow{p} \cdot \overrightarrow{n}\right) \overrightarrow{n}}{\left|\overrightarrow{n}\right|^{2}} \mathbf{d.} \cdot \overrightarrow{s} = p - \frac{\left(q - \overrightarrow{p} \cdot \overrightarrow{n}\right) \overrightarrow{n}}{\left|\overrightarrow{n}\right|^{2}}$$

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183. The angle between i and line of the intersection of the plane \overrightarrow{r} . $(\hat{i} + 2\hat{j} + 3\hat{k}) = 0$ and \overrightarrow{r} . $(3\hat{i} + 3\hat{j} + \hat{k}) = 0$ is a. $\cos^{-1}\left(\frac{1}{3}\right)$ b. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ c. $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$ d. none of these

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184. From the point P(a, b, c), let perpendicualars PLandPM be drawn

to YOZandZOX planes, respectively. Then the equation of the plane

$$OLM \text{ is a. } \frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 0 \text{ b. } \frac{x}{a} + \frac{y}{b} - \frac{z}{c} = 0 \text{ c. } \frac{x}{a} - \frac{y}{b} - \frac{z}{c} = 0 \text{ d.}$$
$$\frac{x}{a} - \frac{y}{b} + \frac{z}{c} = 0$$

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185. The plane $\overrightarrow{r} \cdot \overrightarrow{n} = q$ will contain the line $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b}$, if a. $b. n \neq 0, a. n \neq q$ b. $b. n = , a. n \neq q$ c. b. n = 0, a. n = q d. $b. n \neq 0, a. n = q$

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186. Consider triangle AOB in the x - y plane, where $A \equiv (1, 0, 0), B \equiv (0, 2, 0) and O \equiv (0, 0, 0)$. The new position of O, when triangle is rotated about side AB by 90^0 can be a. $\left(\frac{4}{5}, \frac{3}{5}, \frac{2}{\sqrt{5}}\right)$ b. $\left(\frac{-3}{5}, \frac{\sqrt{2}}{5}, \frac{2}{\sqrt{5}}\right)$ c. $\left(\frac{4}{5}, \frac{2}{5}, \frac{2}{\sqrt{5}}\right)$ d. $\left(\frac{4}{5}, \frac{2}{5}, \frac{1}{\sqrt{5}}\right)$

187. Let $\overrightarrow{a} = \hat{i} + \hat{j}$ and $\overrightarrow{b} = 2\hat{i} - \hat{k}$, then the point of intersection of the lines $\overrightarrow{r} \times \overrightarrow{a} = \overrightarrow{b} \times \overrightarrow{a}$ and $\overrightarrow{r} \times \overrightarrow{b} = \overrightarrow{a} \times \overrightarrow{b}$ is a. (3, -1, 1) b. (3, 1, -1) c. (-3, 1, 1) d. (-3, -1, -1)

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188. The line $\frac{x+6}{5} = \frac{y+10}{3} = \frac{z+14}{8}$ is the hypotenuse of an isosceles right-angled triangle whose opposite vertex is (7, 2, 4). Then which of the following in not the side of the triangle?

a.
$$\frac{x-7}{2} = \frac{y-2}{-3} = \frac{z-4}{6}$$

b. $\frac{x-7}{3} = \frac{y-2}{6} = \frac{z-4}{2}$
c. $\frac{x-7}{3} = \frac{y-2}{5} = \frac{z-4}{-1}$

d. none of these

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189. The equation of the plane which passes through the line of intersection of planes $\overrightarrow{r} \cdot \overrightarrow{n}_1 = , q_1, \overrightarrow{r} \cdot \overrightarrow{n}_2 = q_2$ and the is parallel to

the line of intersection of planers \overrightarrow{r} . $\overrightarrow{n}_3 = q_3 and \overrightarrow{r}$. $\overrightarrow{n}_4 - q_4$ is



190. The coordinates of the point P on the line $\overrightarrow{r} = (\hat{i} + \hat{j} + \hat{k}) + \lambda (-\hat{i} + \hat{j} - \hat{k})$ which is nearest to the origin is a. $(\frac{2}{4}, \frac{4}{3}, \frac{2}{3})$ b. $(-\frac{2}{3}, -\frac{4}{3}, \frac{2}{3})$ c. $(\frac{2}{3}, -\frac{4}{3}, \frac{2}{3})$ d. none of these **Watch Video Solution**

191. The ratio in which the line segment joining the points whose position vectors are $2\hat{i} - 4\hat{j} - 7\hat{k}and - 3\hat{i} + 5\hat{j} - 8\hat{k}$ is divided by the plane whose equation is $\hat{r}\hat{i} - 2\hat{j} + 3\hat{k} = 13$ is a. 13:12 internally b. 12:25 externally c. 13:25 internally d. 37:25 internally

192. The number of planes that are equidistant from four non-coplanar

points is

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193. In a three-dimensional coordinate system, P, Q, and R are images of a point A(a, b, c) in the x - y, y - z and z - x planes, respectively. If G is the centroid of triangle PQR, then area of triangle AOG is (O is the origin) (A) 0 (B) $a^2 + b^2 + c^2$ (C) $\frac{2}{3}(a^2 + b^2 + c^2)$ (D) none of these

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194. A plane passing through (1, 1, 1) cuts positive direction of coordinates axes at A, BandC, then the volume of tetrahedron OABC satisfies a. $V \leq \frac{9}{2}$ b. $V \geq \frac{9}{2}$ c. $V = \frac{9}{2}$ d. none of these

195. If lines $x = y = zandx = \frac{y}{2} = \frac{z}{3}$ and third line passing through (1, 1, 1) form a triangle of area $\sqrt{6}$ units, then the point of intersection of third line with the second line will be a. (1, 2, 3) b. 2, 4, 6 c. $\frac{4}{3}$, $\frac{6}{3}$, $\frac{12}{3}$ d. none of these

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196. The point of intersection of the line passing through (0, 0, 1) and intersecting the lines x + 2y + z = 1, -x + y - 2z = 2 and x + y = 2, x + z = 2 with xy plane is a. $\left(\frac{5}{3}, -\frac{1}{3}, 0\right)$ b. (1, 1, 0) c. $\left(\frac{2}{3}, \frac{1}{3}, 0\right)$ d. $\left(-\frac{5}{3}, \frac{1}{3}, 0\right)$

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197. Shortest distance between the lines $\frac{x-1}{1} = \frac{y-1}{1} = \frac{z-1}{1} and \frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{1}$ is equal to a. $\sqrt{14}$ b. $\sqrt{7}$ c. $\sqrt{2}$ d. none of these

198. Distance of point $P(\overrightarrow{p})$ from the plane $\overrightarrow{r} \stackrel{\cdot}{\overrightarrow{n}} = 0$ is a. $\left|\overrightarrow{p} \stackrel{\cdot}{\overrightarrow{n}}\right|$ b.

$$\frac{\left|\overrightarrow{p}\times\overrightarrow{n}\right|}{\left|\overrightarrow{n}\right|} \text{ c. } \frac{\left|\overrightarrow{p}\overrightarrow{n}\right|}{\left|\overrightarrow{n}\right|} \text{ d. none of these}$$

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199. The reflection of the point \overrightarrow{a} in the plane $\overrightarrow{r} \overrightarrow{n} = q$ is a.

$$\vec{a} + \frac{\left(\vec{q} - \vec{a} \cdot \vec{n}\right)}{\left|\vec{n}\right|} \qquad \text{b.} \qquad \vec{a} + 2\left(\frac{\left(\vec{q} - \vec{a} \cdot \vec{n}\right)}{\left|\vec{n}\right|}\right) \vec{n} \qquad \text{c.}$$
$$\vec{a} + \frac{2\left(\vec{q} + \vec{a} \cdot \vec{n}\right)}{\left|\vec{n}\right|^{2}} \vec{n} \text{ d. none of these}$$

200. Line $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b}$ will not meet the plane $\overrightarrow{r} \overrightarrow{n} = q$, if a. $\overrightarrow{b} \overrightarrow{n} = 0, \overrightarrow{a} \overrightarrow{n} = q$ b. $\overrightarrow{b} \overrightarrow{n} \neq 0, \overrightarrow{a} \overrightarrow{n} \neq q$ c. $\overrightarrow{b} \overrightarrow{n} = 0, \overrightarrow{a} \overrightarrow{n} \neq q$ d.

$$\overrightarrow{b}\overset{\cdot}{\overrightarrow{n}}
eq 0,\,\overrightarrow{a}\overset{\cdot}{\overrightarrow{n}}=q$$

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201. If a line makes an angle of $\frac{\pi}{4}$ with the positive direction of each of x-axis and y-axis, then the angel that the line makes with the positive direction of the z-axis is a. $\frac{\pi}{3}$ b. $\frac{\pi}{4}$ c. $\frac{\pi}{2}$ d. $\frac{\pi}{6}$

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202. A parallelepiped S has base points A, B, CandD and upper face points A', B', C', andD'. The parallelepiped is compressed by upper face A'B'C'D' to form a new parallepiped T having upper face points A'', B'', C' and D''. The volume of parallelepiped T is 90 percent of the volume of parallelepiped S. Prove that the locus of A is a plane.

203. Find the equation of the plane containing the lines 2x-y+z-3=0,3x+y+z=5 and a t a distance of $\frac{1}{\sqrt{6}}$ from the point (2,1,-1).



204. A plane which prependicular to two planes 2x - 2y + z = 0 and

x - y + 2z = 4 passes through the point (1, -2, 1) is:

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205. Let P(3, 2, 6) be a point in space and Q be a point on line $\overrightarrow{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(-3\hat{i} + \hat{j} + 5\hat{k})$. Then the value of μ for which the vector $\overrightarrow{P}Q$ is parallel to the plane x - 4y + 3z = 1 is a. 1/4 b. -1/4 c. 1/8 d. -1/8

206. If the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$ intersect, then k is equal to (1) -1 (2) $\frac{2}{9}$ (3) $\frac{9}{2}$ (4) 0

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207. Consider a set of point R in which is at a distance of 2 units from the line $\frac{x}{1} = \frac{y-1}{-1} = \frac{z+2}{2}$ between the planes x - y + 2z = 3 = 0 and x - y + 2z - 2 = 0. (a) The volume of the bounded figure by points R and the planes is $\left(\frac{10}{3}\sqrt{3}\right)\pi$ cube units (b) The area of the curved surface formed by the set of points R is $\left(\frac{20}{\sqrt{6}}\right)\pi$ sq. units The volume of the bounded figure by the set of points R and the planes is $\left(\frac{20}{\sqrt{6}}\right)\pi$ cubic units. (d) The area of the curved surface formed by the set of points R and the planes is $\left(\frac{20}{\sqrt{6}}\right)\pi$ cubic units. (d) The area of the curved surface formed by the set of points R and the planes is $\left(\frac{20}{\sqrt{6}}\right)\pi$ cubic units. (d) The area of the curved surface formed by the set of points R is $\left(\frac{10}{\sqrt{3}}\right)\pi$ sq. units

208. Let L be the line of intersection of the planes 2x + 3y + z = 1 and x + 3y + 2z = 2. If L makes an angles α with the positive x-axis, then $\cos \alpha$ equals

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209. Statement 1: A plane passes through the point A(2, 1, -3). If distance of this plane from origin is maximum, then its equation is 2x + y - 3z = 14. Statement 2: If the plane passing through the point $A\left(\overrightarrow{a}\right)$ is at maximum distance from origin, then normal to the plane is vector \overrightarrow{a} .

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210. Consider the following linear equations: ax + by + cz = 0bx + cy + az = 0 cx + ay + bz = 0 Match the expression/statements in column I with expression/statements in Column II. Column I, Column II $a + b + c \neq 0$ and $a^2 + b^2 + c^2 = ab + bc + ca$, p. the equations represent planes meeting only at a single point $a + b + c = 0anda^2 + b^2 + c^2 \neq ab + bc + ca$, q. the equations represent the line x = y = z $a + b + c \neq 0anda^2 + b^2 + c^2 \neq ab + bc + ca$, r. the equations represent identical planes $a + b + c \neq 0anda^2 + b^2 + c^2 \neq ab + bc + ca$, s. the equations represent the whole of the three dimensional space

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211. If the distance between the plane Ax - 2y + z = d. and the plane

containing the lies $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \text{ and } \frac{x-2}{3} = \frac{4-3}{4} = \frac{z-4}{5} \text{ is } \sqrt{6}, \text{ then}$ |d| isWatch Video Solution **212.** Prove that the volume of tetrahedron bounded by the planes $\vec{r} \cdot n\hat{j} + n\hat{k} = 0, \vec{r} \cdot n\hat{k} + l\hat{i} = 0, \vec{r} \cdot l\hat{i} + m\hat{j} = 0, \vec{r} \cdot l\hat{i} + m\hat{j} + n\hat{k} = \pi s \frac{2p}{3ln}$

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213. If a variable plane forms a tetrahedron of constant volume $64k^3$ with the co-ordinate planes, then the locus of the centroid of the tetrahedron is:

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214. OA, OBandOC, withO as the origin, are three mutually perpendicular lines whose direction cosines are $l_rm_randn_r(r = 1, 2and3)$. If the projection of OAandOB on the plane z = 0 make angles $\varphi_1and\varphi_2$, respectively, with the x-axis, prove that $\tan(\varphi_1 - \varphi_2) = \pm n_3/n_1n_2$.

215. Prove that for all values of
$$\lambda$$
 and μ , the planes
$$\frac{2x}{a} + \frac{y}{b} + \frac{2z}{c} - 1 + \lambda \left(\frac{x}{a} - \frac{2y}{b} - \frac{z}{c} - 2\right) = 0 \quad \text{and} \quad \frac{4x}{a} - \frac{3y}{b} - 5 + \mu \left(\frac{5y}{b} + \frac{4z}{c} + 3\right) = 0 \text{ intersect on the same line.}$$

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216. If P is any point on the plane lx + my + nz = pandQ is a point on

the line OP such that OP. $OQ=p^2$, then find the locus of the point Q_{\cdot}

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217. find the equation of the plane with intercepts 2,3 and 4 on the x, y

and z-axis respectively.



218. A variable plane lx + my + nz = p(wherel, m, n are direction cosines of normal) intersects the coordinate axes at points <math>A, BandC, respectively. Show that the foot of the normal on the plane from the origin is the orthocenter of triangle ABC and hence find the coordinate of the circumcentre of triangle ABC.

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219. P is a point and PMandPN are the perpendicular form $P \rightarrow z - xandx - y$ planes. If OP makes angles $\theta, \alpha, \beta and\gamma$ with the plane OMN and the x - y, y - zandz - x planes, respectively, then prove that $\cos ec^2\theta = \cos ec^2\alpha + \cos ec^2\beta + \cos ec^2\gamma$.

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220. Let a plane ax + by + cz + 1 = 0, wherea, b, c are parameters, make an angle 60^0 with the line x = y = z, 45^0 with the line x = y - z = 0 and θ with the plane x = 0. The distance of the plane from point (2, 1, 1) is 3 units. Find the value of θ and the equation of the plane.



221. Let $x - y \sin \alpha - z \sin \beta = 0, x \sin \alpha + z \sin \gamma - y = 0$ and $x \sin \beta + y \sin \gamma - z = 0$ be the equations of the planes such that $\alpha + \beta + \gamma = \pi/2$ (where α, β and $\gamma \neq 0$). Then show that there is a common line of intersection of the three given planes.

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222. The position vectors of the four angular points of a tetrahedron OABC are (0, 0, 0); (0, 0, 2), (0, 4, 0) and (6, 0, 0) respectively. A point P inside the tetrahedron is at the same distance r from the four plane faces of the tetrahedron. Find the value of r

223. Find the distance of the point (-2, 3, -4) from the line $\frac{x+2}{3} = \frac{2y+3}{4} = \frac{3z+4}{5}$ measured parallel to the plane 4x + 12y - 3z + 1 = 0.

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224. The plane 4x + 7y + 4z + 81 = 0 is rotated through a right angle about its line of intersection with the plane 5x + 3y + 10z = 25. The equation of the plane in its new position is a. x - 4y + 6z = 106 b. x - 8y + 13z = 103 c. x - 4y + 6z = 110 d. x - 8y + 13z = 105

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225. If (a, b, c) is a point on the plane 3x + 2y + z = 7, then find the least value of $2(a^2 + b^2 + c^2)$, using vector method.

226. Let the equation of the plane containing the line x - y - z - 4 = 0 = x + y + 2z - 4 and is parallel to the line of intersection of the planes 2x + 3y + z = 1 and x + 3y + 2z = 2 be x + Ay + Bz + C = 0 Compute the value of |A + B + C|.

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227. Let a_1, a_2, a_3, \dots be in A. P. and h_1, h_2, h_3, \dots in H. P. If

$$a_1 = 2 = h_1, \; ext{ and } \; a_{30} = 25 = h_{30} ext{ then } a_7 h_{24} + a_{14} + a_{17} =$$

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228. If the angle between the plane x - 3y + 2z = 1 and the line $\frac{x-1}{2} = \frac{y-1}{1} = \frac{z-1}{-3}is$, θ then the find the value of $\cos ec\theta$.

229. The length of projection of the line segment joining the points (1, 0, -1)and(-1, 2, 2) on the plane x + 3y - 5z = 6 is equal to a. 2 b. $\sqrt{\frac{271}{53}}$ c. $\sqrt{\frac{472}{31}}$ d. $\sqrt{\frac{474}{35}}$

230. Find the equation of a plane passing through (1, 1, 1) and parallel to the lines L_1 and L_2 direction ratios (1, 0,-1) and (1,-1, 0) respectively. Find the volume of the tetrahedron formed by origin and the points where this plane intersects the coordinate axes.

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231. Find the equation of the plane passing through the points (2, 1, 0), (5, 0, 1) and (4, 1, 1) If P is the point (2, 1, 6) then find point Q such that PQ is perpendicular to the above plane and the mid point of PQ lies on it.

232. For the line
$$rac{x-1}{1}=rac{y-2}{2}=rac{z-3}{3}$$
, which one of the following is

incorrect?

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233. The value of
$$m$$
 for which straight lein
 $3x - 2y + z + 3 = 0 = 4x - 3y + 4z + 1$ is parallel to the plane
 $2x - y + mz - 2 = 0$ is a. -2 b. 8 c. -18 d. 11

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234. Let the equations of a line and plane be $\frac{x+3}{2} = \frac{y-4}{3} = \frac{z+5}{2}$ and 4x - 2y - z = 1, respectively, then a. the line is parallel to the plane b. the line is perpendicular to the plane c. the line lies in the plane d. none of these

235. The length of the perpendicular form the origin to the plane passing through the point a and containing the line $\overrightarrow{r} = \overrightarrow{b} + \lambda \overrightarrow{c}$ is a. $\frac{\left[\overrightarrow{a} \overrightarrow{b} \overrightarrow{c}\right]}{\left|\overrightarrow{a} \times \overrightarrow{b} + \overrightarrow{b} \times \overrightarrow{c} + \overrightarrow{c} \times \overrightarrow{a}\right|}$ b. $\frac{\left[\overrightarrow{a} \overrightarrow{b} \overrightarrow{c}\right]}{\left|\overrightarrow{a} \times \overrightarrow{b} + \overrightarrow{b} \times \overrightarrow{c}\right|}$ c. $\frac{\left[\overrightarrow{a} \overrightarrow{b} \overrightarrow{c}\right]}{\left|\overrightarrow{b} \times \overrightarrow{c} + \overrightarrow{c} \times \overrightarrow{a}\right|}$ d. $\frac{\left[\overrightarrow{a} \overrightarrow{b} \overrightarrow{c}\right]}{\left|\overrightarrow{c} \times \overrightarrow{a} + \overrightarrow{a} \times \overrightarrow{b}\right|}$

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236. In a three-dimensional xyz space , the equation $x^2-5x+6=0$

represents a. Points b. planes c. curves d. pair of straight lines



237. The line
$$\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-1}{-1}$$
 intersects the curve $xy = c^2, z = 0$ if c is equal to a. ± 1 b. $\pm \frac{1}{3}$ c. $\pm \sqrt{5}$ d. none of these



238. A unit vector parallel to the intersection of the planes

$$\overrightarrow{r}$$
. $(\hat{i} - \hat{j} + \hat{k}) = 5$ and \overrightarrow{r} . $(2\hat{i} + \hat{j} - 3\hat{k}) = 4$ a. $\frac{2\hat{i} + 5\hat{j} - 3\hat{k}}{\sqrt{38}}$ b.
 $\frac{-2\hat{i} + 5\hat{j} - 3\hat{k}}{\sqrt{38}}$ c. $\frac{2\hat{i} + 5\hat{j} - 3\hat{k}}{\sqrt{38}}$ d. $\frac{-2\hat{i} - 5\hat{j} - 3\hat{k}}{\sqrt{38}}$

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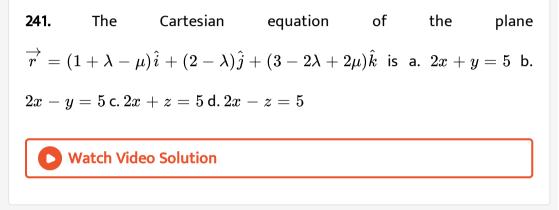
239. Let L_1 be the line $\overrightarrow{r}_1 = 2\hat{i} + \hat{j} - \hat{k} + \lambda(\hat{i} + 2\hat{k})$ and let L_2 be the line $\overrightarrow{r}_2 = 3\hat{i} + \hat{j} + \mu(\hat{i} + \hat{j} - \hat{k})$. Let π be the plane which contains the line L_1 and is parallel to L_2 . The distance of the plane π from the origin is a. $\sqrt{6}$ b. 1/7 c. $\sqrt{2/7}$ d. none of these

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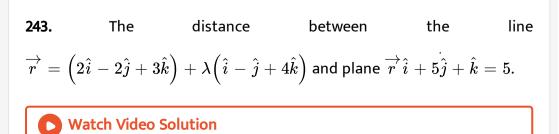
240. The distance of point A(-2,3,1) from the line PQ through P(-3,5,2), which makes equal angles with the axes is a $2/\sqrt{3}$ b.

 $\sqrt{14/3}$ c. $16/\sqrt{3}$ d. $5/\sqrt{3}$





242. Find the angle between the lines
$$\vec{r} = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda\Big(\hat{i} + 2\hat{j} + 2\hat{k}\Big)$$
and $\vec{r} = \Big(5\hat{j} - 2\hat{k}\Big) + \mu\Big(3\hat{i} + 2\hat{j} + 2\hat{k}\Big)$



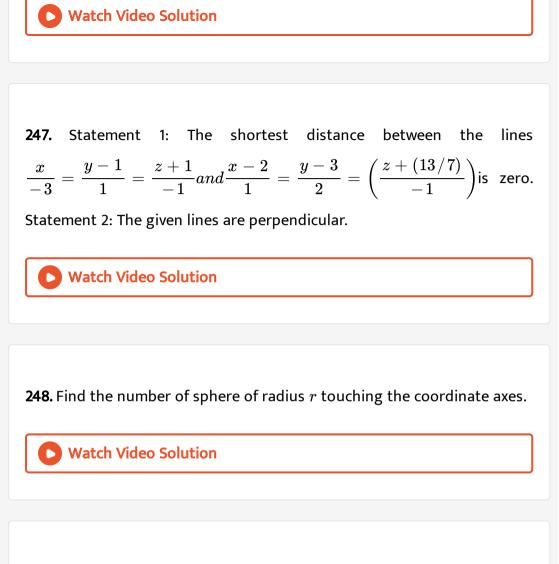
244. Let L be the line of intersection of the planes 2x+3y+z=1 and x+3y+2z=2 . If L makes an angles lpha with the positive x-axis, then \coslpha equals

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245. Statement 1: there exists a unique sphere which passes through the three non-collinear points and which has the least radius. Statement 2: The centre of such a sphere lies on the plane determined by the given three points.

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246. Statement 1: There exist two points on the $\frac{x-1}{1} = \frac{y}{-1} = \frac{z+2}{2}$ which are at a distance of 2 units from point (1, 2, -4). Statement 2: Perpendicular distance of point (1, 2, -4) form the line $\frac{x-1}{1} = \frac{y}{-1} = \frac{z+2}{2}$ is 1 unit.



249. Find the distance of the z-axis from the image of the point

M(2-3,3) in the plane x-2y-z+1=0.

250. A line with direction cosines proportional to 1, -5, and - 2 meets lines x = y + 5 = z + 11andx + 5 = 3y = 2z. The coordinates of each of the points of the intersection are given by a. (2, -3, 1) b. (1, 2, 3) c. (0, 5/3, 5/2) d. (3, -2, 2)



251. If the planes
$$\vec{r}\hat{i}+\dot{\hat{j}}+\hat{k}=q_1, \vec{r}\hat{i}+2a\hat{j}+\hat{k}=q_2and\vec{r}a\hat{i}+a^2\hat{j}+\hat{k}=q_3$$

intersect in a line, then the value of a is a. 1 b. 1/2 c. 2 d. 0

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252. The equation of a line passing through the point \overrightarrow{a} parallel to the plane $\overrightarrow{r} \cdot \overrightarrow{n} = q$ and perpendicular to the line $\overrightarrow{r} = \overrightarrow{b} + t\overrightarrow{c}$ is a. $\overrightarrow{r} = \overrightarrow{a} + \lambda \left(\overrightarrow{n} \times \overrightarrow{c}\right)$ b. $\left(\overrightarrow{r} - \overrightarrow{a}\right) \times \left(\overrightarrow{n} \times \overrightarrow{c}\right)$ c. $\overrightarrow{r} = \overrightarrow{b} + \lambda \left(\overrightarrow{n} \times \overrightarrow{c}\right)$ d. none of these **253.** A straight line L on the xy-plane bisects the angle between OXandOY. What are the direction cosines of L? a. $\langle (1/\sqrt{2}), (1/\sqrt{2}), 0 \rangle$ b. $\langle (1/2), (\sqrt{3}/2), 0 \rangle$ c. $\langle 0, 0, 1 \rangle$ d. $\langle 2/3 \\ 2/3 \\ 1/3 \rangle$

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254. Statement 1: Vector $\overrightarrow{c} = 5\hat{i} + 7\hat{j} + 2\hat{k}$ is along the bisector of angel between $\overrightarrow{a} = \hat{i} + 2\hat{j} + 2\hat{k}and\overrightarrow{b} = -8\hat{i} + \hat{j} - 4\hat{k}$. Statement 2: \overrightarrow{c} is equally inclined to $\overrightarrow{a}and\overrightarrow{b}$. Which of the following statements is/are correct ?

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255. The equation of the line x + y + z - 1 = 0, 4x + y - 2z + 2 = 0

written in the symmetrical form is

256. The equation of two straight lines are $\frac{x-1}{2} = \frac{y+3}{1} = \frac{z-2}{-3}$ and $\frac{x-2}{1} = \frac{y-1}{3} = \frac{z+3}{2}$. Statement 1: the given lines are coplanar. Statement 2: The equations 2r - s = 1, r + 3s = 4and3r + 2s = 5 are consistent.

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257. Statement 1: Lines $\overrightarrow{r} = \hat{i} + \hat{j} - \hat{k} + \lambda (3\hat{i} - \hat{j}) and \overrightarrow{r} = 4\hat{i} - \hat{k} + \mu (2\hat{i} + + 3\hat{k})$ intersect. Statement 2: $\overrightarrow{b} \times \overrightarrow{d} = 0$, then lines $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b} and \overrightarrow{r} = \overrightarrow{c} + \lambda \overrightarrow{d}$ do not intersect.

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258. Statement 1: Line $\frac{x-1}{1} = \frac{y-0}{2} = \frac{z^2}{-1}$ lies in the plane 2x - 3y - 4z - 10 = 0. Statement 2: if line $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b}$ lies in the

plane
$$\overrightarrow{r} \stackrel{\cdot}{\overrightarrow{c}} = n(wheren \text{ is scalar}), then \stackrel{
ightarrow}{\overrightarrow{b}} \stackrel{\cdot}{\overrightarrow{c}} = 0.$$

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259. What is the equation of the plane which passes through the z-axis and is perpendicular to the line $\frac{x-a}{\cos\theta} = \frac{y+2}{\sin\theta} = \frac{z-3}{0}$? (A) $x + y \tan\theta = 0$ (B) $y + x \tan\theta = 0$ (C) $x \cos\theta - y \sin\theta = 0$ (D) $x \sin\theta - y \cos\theta = 0$

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260. Statement 1: let $A\left(\overrightarrow{i} + \overrightarrow{j} + \overrightarrow{k}\right) and B\left(\overrightarrow{i} - \overrightarrow{j} + \overrightarrow{k}\right)$ be two points. Then point $P\left(2\overrightarrow{i} + 3\overrightarrow{j} + \overrightarrow{k}\right)$ lies exterior to the sphere with AB as its diameter. Statement 2: If AandB are any two points and P is a point in space such that $\overrightarrow{P} A\overrightarrow{P} B > 0$, then point P lies exterior to the sphere with AB as its diameter.

261. Statement 1: Let θ be the angle between the line $\frac{x-2}{2} = \frac{y-1}{-3} = \frac{z+2}{-2}$ and the plane x + y - z = 5. Then $\theta = \sin^{-1}(1/\sqrt{51})$. Statement 2: The angle between a straight line and a plane is the complement of the angle between the line and the normal to the plane. Which of the following statements is/are correct ?

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262. If the volume of tetrahedron ABCD is 1 cubic units, where A(0, 1, 2), B(-1, 2, 1) and C(1, 2, 1), then the locus of point D is a. x + y - z = 3 b. y + z = 6 c. y + z = 0 d. y + z = -3

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263. A rod of length 2 units whose one ends is (1, 0, -1) and other end

touches the plane x - 2y + 2z + 4 = 0, then which statement is false

264. The equation of the plane which is equally inclined to the lines $\frac{x-1}{2} = \frac{y}{-2} = \frac{z+2}{-1}$ and $= \frac{x+3}{8} = \frac{y-4}{1} = \frac{z}{-4}$ and passing through the origin is/are a. 14x - 5y - 7z = 0 b. 2x + 7y - z = 0 c. 3x - 4y - z = 0 d. x + 2y - 5z = 0

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265. Which of the following lines lie on the plane x + 2y - z + 4 = 0? a. $\frac{x-1}{1} = \frac{y}{-1} = \frac{z-5}{1}$ b. x - y + z = 2x + y - z = 0 c. $\hat{r} = 2\hat{i} - \hat{j} + 4\hat{k} + \lambda\left(3\hat{i} + \hat{j} + 5\hat{k}\right)$ d. none of these

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266. The equations of the plane which passes through (0, 0, 0) and which

is equally inclined to the planes x-y+z-3=0 and x+y=z+4=0 is/are a. y=0 b. x=0 c. x+y=0 d. x+z=0

267. The x-y plane is rotated about its line of intersection with the y-z plane by 45^0 , then the equation of the new plane is/are a. z + x = 0 b.

z-y=0 c. x+y+z=0 d. z-x=0

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268. Consider the planes 3x - 6y + 2z + 5 = 0 and 4x - 12 + 3z = 3. The plane 67x - 162y + 47z + 44 = 0 bisects the angel between the given planes which a contains origin b. is acute c. is obtuse d. none of these

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269. A variable plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ at a unit distance from origin cuts the coordinate axes at A, B and C. Centroid (x, y, z) satisfies the equation $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = K$. The value of K is (A) 9 (B) 3 (C) $\frac{1}{9}$ (D) $\frac{1}{3}$

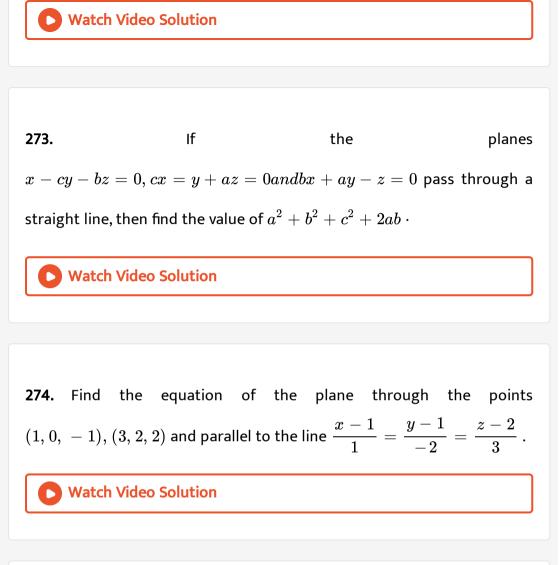
270. Let P = 0 be the equation of a plane passing through the line of intersection of the planes 2x - y = 0 and 3z - y = 0 and perpendicular to the plane 4x + 5y - 3z = 8. Then the points which lie on the plane P = 0 is/are a. (0, 9, 17) b. (1/7, 21/9) c. (1, 3, -4) d. (1/2, 1, 1/3)



271. The equation of the line x + y + z - 1 = 0, 4x + y - 2z + 2 = 0 written in the symmetrical form is

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272. A point P moves on a plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$. A plane through P and perpendicular to OP meets the coordinate axes at A, BandC. If the planes through A, BandC parallel to the planes x = 0, y = 0andz = 0, respectively, intersect at Q, find the locus of Q.



275. A variable plane passes through a fixed point (α, β, γ) and meets the axes at A, B, andC show that the locus of the point of intersection of the planes through A, BandC parallel to the coordinate planes is $\alpha x^{-1} + \beta y^{-1} + \gamma z^{-1} = 1.$ 276. Show that the straight lines whose direction cosines are given by the equations al + bm + cn = 0 and $ul^2 + vm^2 + wn^2 = 0$ are parallel or perpendicular as $\frac{a^2}{u} + \frac{b^2}{v} + \frac{c^2}{w} = 0$ or $a^2(v+w) + b^2(w+u) + c^2(u+v) = 0$

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277. The perpendicular distance of a corner of uni cube from a diagonal not passing through it is

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278. If the direction cosines of a variable line in two adjacent points be $l, M, n \text{ and } l + \delta l, m + \delta m + n + \delta n$ the small angle $\delta \theta$ as between the two positions is given by

279. the image of the point (-1, 3, 4) in the plane x - 2y = 0 a. $\left(-\frac{17}{3}, \frac{19}{3}, 4\right)$ b.(15,11,4) c. $\left(-\frac{17}{3}, \frac{19}{3}, 1\right)$ d. $\left(\frac{9}{5}, -\frac{13}{5}, 4\right)$

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280. The ratio in which the plane $\overrightarrow{r} \cdot \left(\overrightarrow{i} - 2\overrightarrow{j} + 3\overrightarrow{k}\right) = 17$ divides the line joining the points $-2\overrightarrow{i} + 4\overrightarrow{j} + 7\overrightarrow{k}$ and $3\overrightarrow{i} - 5\overrightarrow{j} + 8\overrightarrow{k}$ is a. 1:5 b. 1: 10 c. 3: 5 d. 3: 10

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281. Let L be the line of intersection of the planes 2x + 3y + z = 1 and x + 3y + 2z = 2. If L makes an angles α with the positive x-axis, then $\cos \alpha$ equals a. $\frac{1}{\sqrt{3}}$ b. $\frac{1}{2}$ c. 1 d. $\frac{1}{\sqrt{2}}$

282. The distance between the line $\overrightarrow{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - \hat{j} + 4\hat{k})$ and the plane $\overrightarrow{r}\hat{i} + 5\hat{j} + \hat{k} = 5$ is a. $\frac{10}{3\sqrt{3}}$ b. $\frac{10}{9}$ c. $\frac{10}{3}$ d. $\frac{3}{10}$

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283. If angle θ bertween the line $\frac{x+1}{1} = \frac{y-1}{2} = \frac{z-2}{2}$ and the plane $2x - y + \sqrt{\lambda}z + 4 = 0$ is such that $\sin \theta = 1/3$, the value of λ is a. $-\frac{3}{5}$ b. $\frac{5}{3}$ c. $-\frac{4}{3}$ d. $\frac{3}{4}$ **()** Watch Video Solution

284. The length of the perpendicular drawn from (1, 2, 3) to the line

$$rac{x-6}{3} = rac{y-7}{2} = rac{z-7}{-2}$$
 is a. 4 b. 5 c. 6 d. 7

285. A plane makes intercepts OA, OBandOC whose measurements are a, b and c on the OX, OYandOZ axes. The area of triangle ABC is a. $\frac{1}{2}(ab + bc + ca)$ b. $\frac{1}{2}abc(a + b + c)$ c. $\frac{1}{2}(a^2b^2 + b^2c^2 + c^2a^2)^{1/2}$ d. $\frac{1}{2}(a + b + c)^2$

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286. The intersection of the spheres $x^2 + y^2 + z^2 + 7x - 2y - z = 13andx^2 + y^2 + z^2 - 3x + 3y + 4z = 8$ is the same as the intersection of one of the spheres and the plane a. x - y - z = 1 b. x - 2y - z = 1 c. x - y - 2z = 1 d. 2x - y - z = 1

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287. The shortest distance from the plane 12x + 4y + 3z = 327 to the sphere $x^2 + y^2 + z^2 + 4x - 2y - 6z = 155$ is a. 39 b. 26 c. $41 - \frac{4}{13}$ d. 13

288. A line makes an angel θ with each of the x-and z-axes. If the angel β ,

which it makes with the y-axis, is such that $\sin^2 eta = 3 \sin^2 heta$,then $\cos^2 heta$

equals a.
$$rac{2}{3}$$
 b. $rac{1}{5}$ c. $rac{3}{5}$ d. $rac{2}{5}$

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289. Find the equation of a straight line in the plane $\overrightarrow{r} \cdot \overrightarrow{n} = d$ which is parallel to $\overrightarrow{r} = \overrightarrow{a} + \lambda \overrightarrow{b}$ and passes through the foot of the perpendicular drawn from point

$$P\left(\overrightarrow{a}
ight)
ightarrow \overrightarrow{r n} = d\left(where \overrightarrow{n b} = 0
ight)$$
 a.

$$\overrightarrow{r} = \overrightarrow{a} + \left(rac{d - \overrightarrow{a} \cdot \overrightarrow{n}}{n^2}
ight) n + \lambda \overrightarrow{b}$$
 b.

$$\overrightarrow{r} = \overrightarrow{a} + \left(rac{d - \overrightarrow{a} \cdot \overrightarrow{n}}{n}
ight) n + \lambda \overrightarrow{b}$$
 c.

$$\overrightarrow{r} = \overrightarrow{a} + \left(\frac{\overrightarrow{a} \cdot \overrightarrow{n} - d}{n^2} \right) n + \lambda \overrightarrow{b}$$
 d.

$$\overrightarrow{r} = \overrightarrow{a} + igg(rac{\overrightarrow{a} \cdot \overrightarrow{n} - d}{n} igg) n + \lambda \, \overrightarrow{b}$$

290. What is the nature of the intersection of the set of planes x + ay + (b + c)z + d = 0, x + by + (c + a)z + d = 0 and x + cy + (a + b) d (a). they meet at a point (b). they form a triangular prism (c). they pass through a line (d). they are at equal distance from the origin

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291. Let P_1 denote the equation of a plane to which the vector $(\hat{i} + \hat{j})$ is normal and which contais the line whose equation is $\vec{r} = \hat{i} + \hat{j} + \hat{k} + \lambda (\hat{i} - \hat{j} - \hat{k}) and P_2$ denote the equation of the plane containing the line L and a point with position vector \hat{j} . Which of the following holds good? a. The equation of P_1 is x+y=2. b. The equation of P_2 is \vec{r} . (i - 2j + k) = 2 c. The acute angle between P_1 and P_2 is $\cot^{-1}\sqrt{3}$ d. The angle between plane P_2 and the line L is $\tan^{-1}\sqrt{3}$



292. Let PM be the perpendicular from the point P(1, 2, 3) to the x - yplane. If $\overrightarrow{O}P$ makes an angle θ with the positive direction of the z - axis and $\overrightarrow{O}M$ makes an angle ϕ with the positive direction of x - axis, where O is the origin and $\theta and \phi$ are acute angels, then a. $\cos \theta \cos \phi = 1/\sqrt{14}$ b. $\sin \theta \sin \phi = 2/\sqrt{14}$ c. $\tan \phi = 2$ d. $\tan \theta = \sqrt{5}/3$

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293. If the plane $\frac{x}{2} + \frac{y}{3} + \frac{z}{6} = 1$ cuts the axes of coordinates at points, A, B, andC, then find the area of the triangle ABC a. 18sq unit b. 36squnit c. $3\sqrt{14}sq$ unit d. $2\sqrt{14}sq$ unit

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294. For what value (s) of a will the two points (1, a, 1) and (-3, 0, a)

lie on opposite sides of the plane 3x + 4y - 12z + 13 = 0?

